Modifying Pro-Drug Risk Factors in Adolescents: Results From Project ALERT

Bonnie Ghosh-Dastidar, PhD
Douglas L. Longshore, PhD
Phyllis L. Ellickson, PhD
Daniel F. McCaffrey, PhD

The objective of this study was to evaluate the impact of a revised state-of-the-art drug prevention program, Project ALERT, on risk factors for drug use in mostly rural midwestern schools and communities. Fifty-five middle schools from South Dakota were randomly assigned to treatment or control conditions. Treatment-group students received 11 lessons in Grade 7 and 3 more in Grade 8. Effects for 4,276 eighth graders were assessed 18 months after baseline. Results indicate that Project ALERT had statistically significant effects on all the targeted risk factors associated with cigarette and marijuana use and more modest gains with the pro-alcohol risk factors. The program helped adolescents at low, moderate, and high risk for future use, with the effect sizes typically stronger for the low- and moderate-risk groups. Thus, school-based drug prevention programs can lower risk factors that correlate with drug use, help low- to high-risk adolescents, and be effective in diverse school environments.

Keywords: *drug prevention; proximal outcome; social influence model*

Project ALERT is one of several drug prevention programs that use a social influence model,[1] seeking to motivate young people to resist pro-drug pressures and to help them identify and combat those pressures. Such strategies emphasize social influences in the acquisition and maintenance of drug use[2] and have proven to be more effective than educational and affective programs.[3] Generally speaking, prevention programs are designed to affect one or more risk factors for drug use. These risk factors represent proximal outcomes of the program and may mediate the effect of the program on subsequent drug use. Prevention programs that use a social-influence approach are designed to modify risk factors such as resistance self-efficacy; beliefs about consequences of use; expectations of use and psychological well-being; as well as peer, adult, and media influences to use drugs.[4] If these programs work as planned, then favorable changes in these proximal outcomes are the first indicators of success.

Bonnie Ghosh-Dastidar, Douglas L. Longshore, and Phyllis L. Ellickson, RAND, Santa Monica, California. Daniel F. McCaffrey, RAND, Pittsburgh, Pennsylvania.

Address reprint requests to Bonnie Ghosh-Dastidar, RAND, 1700 Main St., P. O. Box 2138, Santa Monica, CA 90407-2138; phone: (310) 867-5789; fax: (310) 451-7068; e-mail: bonnieg@rand.org.

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Several social-influence-based school prevention programs have demonstrated effects on substance use. These include the Life Skills Training program (LST),[5] the Midwestern Prevention Project,[6] and Project Northland.[7] Although these programs have a common theoretical underpinning, they may differ in their approach to implementation (e.g., add a family or community component to the school-based curriculum) and may target slightly different groups of risk factors (e.g., include life skills or not).

The LST curriculum targets general life skills and skills for resisting social influences to drugs through lessons delivered in school. In a particular article where the program's effects on proximal outcomes are discussed, the authors examined the effect of 15 sessions delivered in seventh grade on risk factors and smoking, among urban minority youth. The program was found to favorably affect knowledge about smoking prevalence, immediate consequences, social acceptability, and normative expectations.[8] However, it had no effect on antismoking attitudes or distal mediators of smoking initiation (e.g., self-efficacy, self-esteem, decision making, assertiveness, and psychological well-being).

The second study, the Midwestern Prevention Project, is a school-based program with an additional community component. The school-based curriculum delivered to sixth and seventh graders includes 10 in-class sessions on skills training for resistance of drugs and mass media coverage, with 10 homework sessions involving active role-plays with parents and family members. The program was found to be successful in changing perceptions about positive consequences of use, friends' reactions to drug use, intentions not to use, and communication skills. However, there were no statistically significant effects on students' beliefs about the negative consequences of use, beliefs about the external influences to use drugs, resistance skills, and perceived peer norms.[9]

The third study, Project Northland, is a randomized trial to evaluate multilevel, community-wide strategies implemented in schools (Grades 6-8) and in the intervention communities around the schools, during the same period. Analysis of program effects on hypothesized risk factors in the overall sample showed significant effects on the functional meanings of alcohol use (reasons not to use), peer norms and peer influence, skills to resist specific peer situations (resist alcohol at a party or at a dance), and parent-child communication about the consequences of drinking. The overall Self-Efficacy Scale; the perceived consequences of drinking after driving; and the larger social environment, including access to alcohol in the community, were less likely to be affected.[10]

In summary, results from analyses of proximal outcomes in these three studies indicated significant program effects for norms (perceptions about prevalence of use, social acceptability knowledge, normative expectations, and friends' reactions to drug use), commitment to not use, and intentions. The effects on resistance self-efficacy and beliefs about consequences varied by program, however, whereas no effects were noted for social skills, self-esteem, and psychological well-being.[8-10] Only the Project Northland study assessed program effects for high-risk youths, finding just one significant effect that kids were more likely to report difficulty in finding alcohol at a party. The effects on Peer Influence, Self-Efficacy, and Perceived-Access Scales, however, were not significant for this group. Such analyses are important because evidence suggests that youths at different risk levels may respond differently to the same program content.[11]

Project ALERT, a school-based curriculum for seventh and eighth graders was originally tested in 30 schools across California and Oregon in a predominantly urban and suburban setting and found to be effective in preventing or reducing marijuana and cigarette use during the junior high years.[12] Development of the Project ALERT curriculum was guided by three theoretical models applicable to health promotion and behavior change—the health belief model (HBM),[13] the self-efficacy theory of behavior change,[2]

and social influence theory.[14] The HBM informed the program's emphasis on helping adolescents understand the salience and seriousness of consequences associated with drug use, reducing barriers to effective drug resistance (e.g., having intentions to use), and highlighting the benefits of nonuse. Self-efficacy theory fostered the curriculum's emphasis on building confidence in one's ability to successfully resist pro-drug pressures, the lack of which is deemed an important barrier to effective drug resistance. Social influence theory contributed to the curriculum's focus on modifying two additional barriers to effective resistance—normative perceptions that drug use is widespread and socially approved, particularly among one's peers, plus lack of resistance skills.

Thus, the curriculum was specifically designed to affect risk factors across four cognitive domains: beliefs about the consequences of using drugs (outcome expectancies), normative perceptions about the prevalence of use and its acceptability to others, resistance self-efficacy (confidence that one can successfully resist pro-drug pressures), and expectations about future drug use. The original evaluation found that ALERT had significant effects on targeted variables in all four domains.[15] In addition, it found specific effects for adolescents at different levels of risk for future use. Hence, ALERT's results paralleled those of other studies, while also countering the belief that universalistic programs helped only those youths who were at least at risk for future substance use and abuse.

The four cognitive domains discussed above are important prevention targets because they have been shown to have strong associations with drug use and are amenable to change. Also, in a review of school-based alcohol prevention programs,[16] they ranked in the Top 5 of 12 groups of proximal outcomes classified according to the strength of their relationship with alcohol use among youths. Among cognitive risk factors, expectations of using a specific drug typically show the strongest link with subsequent use of that drug.[15,17] Beliefs that drug use has negative consequences have been shown to curb use, whereas positive expectations enhance it.[9,18,19] Several studies have also demonstrated links between normative beliefs about how many of their peers use tobacco or alcohol and actual use.[20,21] Others have shown that parental and peer tolerance of drug use promotes greater use among adolescents, whereas confidence in one's own ability to resist drugs inhibits use.[15,22-24]

Based on the results of the original field experiment, Project ALERT was revised and strengthened with the addition of parent involvement activities, material on alcohol misuse, and a lesson designed to help smokers quit. These additions were designed to improve the program's impact on alcohol use and to overcome its ineffectiveness with committed smokers. A recent evaluation of the revised curriculum shows that Project ALERT curbs alcohol misuse, as well as cigarette and marijuana use, and that it helps both high- and low-risk adolescents, including the high-risk early smokers.[25]

This study, which is designed to complement the evaluation of program effects on drug use, assesses the following: (a) whether, and to what degree, the revised ALERT program reduced pro-drug beliefs among middle-school students; (b) the *replicability* of ALERT results with a revised curriculum implemented a decade later and whether the revised program improved on the original results; and (c) the *generalizability* of ALERT to a new setting (mostly rural and small-town Midwest) with a different study population (mostly White and Native American). It does so by evaluating 18-month program effects on cognitive risk factors for treatment and control students from 55 midwestern schools and comparing them with the earlier results. On the basis of the theory that guided curriculum development, we expected to find program effects for variables from all four of the targeted domains. In addition, on the basis of the curriculum modifications made in

response to earlier findings and the recent results on drug use, we expected the revised program to have better results than the original, both for the entire sample and for high-risk youths.

This study contributes to the literature by providing information on proximal-outcome effects for alcohol, cigarette, and marijuana use across all students in the study and for adolescents at different levels of risk for substance use. It also builds on previous research by revising and reevaluating a previously tested drug prevention curriculum, asking whether its results support the program's theoretical underpinnings, and comparing the results with those from other programs guided by a similar theoretical perspective.

METHOD

Study Design

The Project ALERT field experiment was designed to test a revised curriculum with 11 lessons in 7th grade, 3 lessons in 8th grade, and 5 booster lessons in high school Grades 9 and 10. The high school component is called ALERT Plus. The ALERT curriculum seeks to help adolescents recognize that most people do not use drugs or approve of doing so, understand the benefits of not using, develop reasons not to use, and understand the immediate and long-term consequences of drug use. It also seeks to build resistance self-efficacy by helping adolescents identify and resist both internal and external pressures to use drugs and by providing role models for nonuse. The revised middle school curriculum includes 2 additional lessons, one on smoking cessation and one on alcohol misuse, plus a series of new home-learning activities that encourage parental involvement in substance use prevention during 7th and 8th grades.

To test the effectiveness of the revised curriculum, we randomly assigned 48 school clusters (high schools and their middle school feeders) in South Dakota to one of three conditions: ALERT, ALERT Plus, or control. This analysis covers seventh and eighth grades, when ALERT and ALERT Plus are identical. Hence, the experimental comparison is ALERT (delivered in ALERT or ALERT Plus schools) versus control. There were 4,276 participants from 55 middle schools—2,553 from 34 middle schools receiving the updated Project ALERT curriculum and 1,723 students from 21 control schools. Nine of the schools were in cities with more than 50,000 residents, 11 schools were in towns with 5,000 to 25,000 residents, and the remaining schools were in rural areas. Students in the treatment clusters received lessons in seventh and eighth grades; students in the control clusters did not receive the Project ALERT curriculum but continued to receive any prevention curricula already in place.

Analysis Sample

Of the 4,689 students who completed baseline surveys, 413 (8.8%) missed the first follow-up, resulting in an analysis sample of 4,276 students. The nonrespondents were more likely to be non-White and male; have low grades (C or below); live with a single parent or step-parent; and have used alcohol, cigarettes, or marijuana. Across both experimental conditions, students omitted from the analysis were more likely than those in the analysis to have pretreatment characteristics cited as risk factors (e.g., offers and intentions to use). The analysis sample of 4,276 students included those who completed both the baseline and 18-month follow-up surveys, constituting 91% of the baseline sample.

Half of the sample was female, 12.5% were non-White (largely Native American), and slightly more than 30% did not live with both biological parents. About three-fifths had tried alcohol, about one-third had smoked a cigarette, and 6.6% had tried marijuana. Student characteristics and baseline values of the cognitive factors by experimental condition (Table 1) indicate that the two groups were similar at baseline.

Missing Data

We did not reweight the sample to account for study attrition because the attrition rate was quite low and did not differ across experimental groups. However, the percentage of missing values for baseline covariates used in this analysis ranged from 0.05% to 10%; therefore, these missing values were multiply imputed using a Bayesian model for the joint distribution of all baseline and follow-up data.[26] We created five sets of imputations for each missing value, using the NORM software.[27] Each imputed data set was separately analyzed. To produce the overall results reported in this article, results from the five imputed data sets were combined using Rubin's rules of multiple-imputation inference.[28]

Measures of Independent and Dependent Variables

Beliefs About Drug Use Consequences. We elicited perceptions about the social benefits of using alcohol, cigarettes, and marijuana, including positive and negative expectancies, using a battery of six items measured on a 4-point scale (1 = *strongly agree* to 4 = *strongly disagree*). For cigarettes, we asked whether smoking cigarettes (a) relaxes you, (b) makes you do poorly in sports, (c) gets you into trouble at school, (d) helps you get away from your problems, (e) makes other people not want to be around you, and (f) helps you stay thin. For alcohol, we asked whether drinking alcohol (a) relaxes you, (b) makes you do things you might regret, (c) lets you have more fun, (d) helps you get away from your problems, (e) gets you into trouble, and (f) slows down your reaction time. For marijuana, we asked the first four alcohol items plus two others, whether using marijuana (a) makes it hard to remember things and (b) makes you do poorly in school. The six items for each drug formed an internally consistent scale of beliefs about near-term social consequences (with Cronbach's alpha of .67 for cigarettes, .68 for alcohol, and .75 for marijuana). Participants were also asked to respond on the same 4-point scale about (1) the likelihood of becoming dependent and (2) suffering harm because of occasional cigarette, alcohol, or marijuana use.

Normative Beliefs, Resistance Self-Efficacy, and Expectations About Future Use. To tap normative perceptions, we asked students to estimate the percentage of peers in their school who use alcohol, cigarettes, and marijuana. Participants were also asked about their friends' reactions if they "found out that you smoked (drank alcohol or used marijuana) sometimes" (1 = *they would disapprove and stop being my friends* to 4 = *they would approve*) and if they agreed with the following statement: Kids actually respect you more if you refuse to smoke/drink/use marijuana (1 = *strongly agree* to 4 = *strongly disagree*). Low resistance self-efficacy was assessed with a battery of four items per drug, asking participants to rate their ability to resist smoking/drinking/using marijuana in several hypothetical situations (1 = *I would definitely not use* to 4 = *I would definitely use*). The situations for cigarettes were the following: (a) Your best friend is smoking, (b) your date is smoking, (c) you are bored at a party, and (d) all your friends at a party are smoking. We asked an identical set of questions for alcohol and marijuana, combining the four

Table 1. Mean Student Characteristics and Baseline Values of Cognitive Risk Factors in the Analysis Sample ($N = 4,276$) by Experimental Condition

Characteristic/Risk Factor	Control Students ($n = 1,723$)	ALERT Students ($n = 2,553$)
Drug specific		
Male	50.0%	52.1%
Non-White	15.7%	10.4%
Low grades (C or lower)	22.7%	20.1%
Father not a high school graduate	27.9%	31.6%
Does not live with both biological parents	30.2%	30.9%
Alcohol related		
Nonhealth beliefs	1.53	1.53
Risk of dependence	1.77	1.76
Harm of occasional use	1.86	1.95
Perceived prevalence seventh grade	23.3%	22.6%
Friends' approval of use	2.07	2.04
Friends' respect for not using	1.82	1.83
Resistance self-efficacy	1.51	1.51
Expectations of future use	1.55	1.53
Cigarette related		
Nonhealth beliefs	1.59	1.60
Risk of dependence	1.55	1.57
Harm of occasional use	1.81	1.87
Perceived prevalence 7th grade	24.9%	23.4%
Friends' approval of use	1.99	1.94
Friends' respect for not using	1.75	1.72
Resistance self-efficacy	1.49	1.47
Expectations of future use	1.42	1.38
Marijuana related		
Nonhealth beliefs	1.48	1.44
Risk of dependence	1.59	1.59
Harm of occasional use	1.53	1.62
Perceived prevalence seventh grade	12.5%	10.1%
Friends' approval of use	1.60	1.56
Friends' respect for not using	1.74	1.70
Resistance self-efficacy	1.24	1.19
Expectations of future use	1.16	1.11

NOTE: Student characteristics and perceived prevalence at seventh grade can assume values in the range 0% to 100%. All other cognitive factors assume values from 1 to 4, with a higher value indicating greater risk of use. More information is provided under Measures of Independent and Dependent Variables. ALERT = treatment group.

items for each substance to create a drug-specific resistance Self-Efficacy Scale ($\alpha = .95$ for cigarettes, .96 for alcohol, and .98 for marijuana). Finally, the participants' future drug use intentions were assessed with one question per substance: Do you think you will smoke (drink or use marijuana) in the next 6 months? (1 = *definitely no* to 4 = *definitely yes*).

Covariates. The covariates in the regression model include the following respondent behaviors and attitudes measured pretreatment at baseline: baseline value of the depend-

ent variable, prior use of and future intentions to use the target substance, prior marijuana use (if not the target substance), resistance self-efficacy, beliefs about the consequences of substance use, perceptions of peer use, deviance, perceived friends' approval of use, and offers to use. We also controlled for several demographic and family variables including participants' age, gender, ethnicity (binary indicator of White or not), school grades, parental education and monitoring, substance use by important adult and siblings, and whether or not the student lives with both biological parents.

The cognitive risk factors were described above. Questions about baseline alcohol, cigarette, and marijuana use asked about lifetime use, number of times used in the past year and past month, and quantity used on days of use. Offers to use were assessed with the question: How many times have you been offered a cigarette (alcohol or marijuana)? The six-item Deviance Scale taps the frequency of stealing; cheating; damaging others' belongings; skipping school; being sent out of class; and breaking into a house, school, or place of business ($\alpha = .80$). Grades were measured as a self-reported average (mostly As to mostly Fs), whereas parental education is the average educational attainment of the student's father and mother (1 = *graduated from college* to 4 = *did not finish high school*). The three-item Parental Monitoring Scale asked participants how often their parents know where they are, tell them what time to be home, and how much of their free time they spend with their parents ($\alpha = .50$). To account for blocking in the assignment of schools to experimental conditions, we included covariates for the school's geographic location and enrollment size.

Analysis Procedures

We attempted to make the schools and students similar across experimental conditions through blocking and restricted randomization.[25] To account for remaining differences between the assignment groups and to increase the precision of our regression models, we adjusted for multiple baseline covariates. Starting with a large set of baseline covariates and using backward stepwise deletion on a model fit to a subsample of the control students and cross-validated on a holdout sample, we selected a common set of covariates to use in any analysis of follow-up outcomes. Furthermore, to account for the fact that substance use among students within the same school is likely to be similar, we adjusted for clustering. To conduct efficient estimation in the presence of intracluster correlation, we used the generalized estimating equation (GEE) methods introduced by Liang and Zeger.[29] These methods produce adjusted standard errors and statistical tests that are unbiased in the presence of intracluster correlation.

For all of the proximal outcomes targeted by ALERT, we ran linear regression models with baseline covariates and a 0/1 indicator of treatment condition on the right-hand side, adjusting for within-school correlation. The models generated covariate-adjusted means and effect sizes by experimental group (Table 2). Note that a higher mean value on a risk factor indicates a greater propensity to use drugs. Hence, the lower the mean value in the ALERT group compared with the control group, the greater the program's favorable impact. We report statistically significant results with p values smaller than .05 but also note p values smaller than .10. Our approach is to emphasize overall findings. In the context of several findings reaching conventional significance levels, it is useful to take note of weaker additional findings in the same direction.

We first present an overview of program effects across the entire analysis sample. We then present program effects for students at different levels of preprogram experience with drugs, considered at different levels of risk for future use. For alcohol, the low-risk

Table 2. Overall Sample Means and Effect Sizes for Cognitive Risk Factors in ALERT and Control Schools at 18 Months From Baseline

	Alcohol (N = 4,276)			Cigarettes (N = 4,276)			Marijuana (N = 4,276)		
Cognitive Risk Factor	ALERT (n = 2,553)	Control (n = 1,723)	Effect Size	ALERT (n = 2,553)	Control (n = 1,723)	Effect Size	ALERT (n = 2,553)	Control (n = 1,723)	Effect Size
Drug use consequences									
Nonhealth beliefs	1.69	1.82	0.14***	1.69	1.82	0.15***	1.54	1.68	0.14***
Risk of dependence	1.76	1.88	0.09***	1.47	1.63	0.13***	1.43	1.60	0.13***
Harm of occasional use	1.94	1.99	0.03	1.79	1.87	0.06***	1.47	1.53	0.05*
Normative beliefs									
Perceived prevalence eighth grade	38.6	42.7	0.12**	33.5	39.2	0.15***	16.4	19.6	0.14**
Friends' approval of use	2.52	2.58	0.04	2.27	2.36	0.07**	1.85	1.98	0.09**
Respect for not using	1.82	2.07	0.17***	1.69	1.88	0.15***	1.62	1.80	0.14***
Resistance self-efficacy	1.98	2.02	0.03	1.68	1.77	0.06***	1.35	1.43	0.07***
Expectations of future use	2.12	2.18	0.04	1.69	1.83	0.10***	1.33	1.42	0.08***

NOTE: The sample means and effect sizes come from a regression model adjusted for clustering and baseline covariates (including prior use of substance, intentions to use the target substance, baseline values of risk factors, and demographic and family variables). The p values correspond to a t test with a cluster-adjusted standard error and degrees of freedom. The effect size is the standardized adjusted mean difference between the two treatment groups. ALERT = treatment group.
*$p < .10$ (not significant). ** Statistically significant at the .05 level. *** Statistically significant at the .01 level.

group includes students who had not tried alcohol at baseline (nonusers, 38.8%). The moderate-risk group includes those who had used alcohol in the past, but less than three times in the past year and not in the past month (experimenters, 45.3%). The high-risk group consists of those who had used alcohol three or more times in the past year or at least once in the past month (users, 15.9%). Similar criteria were used to define the cigarette nonusers (65.2%), experimenters (21.4%), and users (13.4%). Students who had not tried marijuana by seventh grade were a more heterogeneous group including some cigarette experimenters. Hence, we divided marijuana nonusers into those who had not used marijuana or cigarettes by baseline (low risk, 65.0%) and those who had not used marijuana but had tried cigarettes by baseline (moderate risk, 28.5%). The high-risk group includes those who had used marijuana prior to the baseline survey (6.5%).

RESULTS

Combined Sample

As shown in Table 2, the revised Project ALERT had statistically significant program effects on all of the cigarette and marijuana risk factors targeted in eighth grade, except harm of occasional marijuana use. Although the program effects were rarely large, ranging in magnitude from .05 to .15, they were consistent across risk factors. Program effects on the alcohol-specific risk factors were more variable, with an effect size (ES) of about .03 for four of the eight alcohol outcomes and .09 to .17 for the remaining outcomes. We also found no negative program effects, which would have suggested possible boomerang effects of the intervention.

The strongest program effects were for normative beliefs, with consistent results across the three target drugs. The program was successful in reducing the ALERT students' estimates of how many students used each target drug (ES = .12, .15, and .14 for alcohol, cigarettes, and marijuana, respectively, $p < .03$ for all estimates) and in modifying their beliefs that refusing alcohol, cigarettes, and marijuana can bring greater respect from one's friend (ES = .17, .15, and .14 for alcohol, cigarettes, and marijuana, respectively, $p < .005$ for all estimates). Perceptions about peer tolerance of use were significantly modified for cigarettes (ES = .07, $p < .02$) and marijuana (ES = .09, $p < .02$), with a smaller change for alcohol (ES = .04).

ALERT also exhibited significant effects on drug use consequences across the three drugs. Among the drug use consequence measures, the ALERT curriculum changed beliefs about the nonhealth consequences of using alcohol, cigarettes, or marijuana (ES was about .14 for all three substances, $p < .005$). Differences between the treatment and control groups for the perceived risk of becoming dependent on alcohol, cigarette, or marijuana use were also highly significant ($p < .005$), but the effect sizes were larger for cigarettes and marijuana (ES = .13) than alcohol (ES = .09). Beliefs about the harm of occasional use were statistically significant for cigarettes (ES = .06, $p < .02$), but not significant for marijuana (ES = .05) and alcohol (ES = .03).

Program effects on resistance self-efficacy and expectations of future use were higher for cigarettes and marijuana than alcohol. The perceived tendency to use cigarettes or marijuana in one of several social situations (on a date, around friends, at a party, or bored at a party) was significantly lower for the ALERT group (ES = .06 for cigarettes, ES = .07 for marijuana, $p < .005$ both). However, the corresponding measure for alcohol was not

significantly different between the treatment and control groups (ES = .03). Eighteen months after baseline, students in the ALERT schools were also less likely to say yes when asked if they expected to use cigarettes (ES = .10, $p < .005$) or marijuana (ES = .08, $p < .005$) in the next 6 months. The program did not have a significant effect on alcohol use intentions (ES = .04).

In summary, the revised Project ALERT curriculum produced significant program effects on risk factors that are expected to increase cigarette and marijuana use in adolescents, with a more modest impact on factors affecting alcohol use. Consistent with the original study's results, the program was equally effective for cigarettes and marijuana, producing significant effects on all of the targeted risk factors across four domains: beliefs about the consequences of drug use; normative perceptions about the prevalence of use and its acceptability to others; resistance self-efficacy; and expectations about future drug use. In addition, the revised ALERT curriculum exhibited some gains with the alcohol risk factors. Four of the eight risk factors were significantly lower in the ALERT schools ($p < .05$), with significant effects in the drug use consequences and normative beliefs domains.

Risk Groups

As shown in Table 3, Project ALERT had statistically significant effects for the low- and moderate-risk groups for cigarettes across all four attitudinal domains. For the low- and moderate-risk marijuana groups, it had significant effects for drug use consequences and normative beliefs; it also significantly increased resistance self-efficacy in the low-risk marijuana group and significantly decreased future intentions to use in the moderate-risk marijuana group. Although ALERT curbed pro-drug beliefs in all domains except resistance self-efficacy for the highest risk cigarette group, it reduced only normative beliefs for the highest risk marijuana group. The program had fewer effects for alcohol, modifying certain beliefs about drug use consequences and norms across the three risk groups, but it had no direct impact on resistance self-efficacy or intentions to use.

Baseline nonsmokers and experimenters who received Project ALERT were more likely to believe that smoking has negative social consequences, that they could become addicted to it, that their friends would respect them for refusing to smoke, and that they could successfully resist pro-smoking pressures. These two groups were also less likely to plan on smoking in the next 6 months. In addition, baseline nonsmokers had lower estimates of the prevalence of smoking among their peers, whereas baseline experimenters were more likely to believe that occasional smoking could have harmful effects and that their friends would disapprove of their smoking. Project ALERT yielded fewer significant effects for the high-risk baseline smokers, but those that were significant were at least equal in magnitude to the effects among the experimenters and substantially stronger than those for the nonusers. ALERT helped make the more committed baseline smokers aware of the negative consequences (social and addictive) of smoking and the harm of occasional use while also reducing estimates of smoking prevalence among peers and future use intentions.

Program effects for the marijuana risk groups were similar to those for cigarettes. For the low- and moderate-risk groups, ALERT typically yielded significant effects across all four attitudinal domains, with the effect sizes in the moderate-risk group often twice as large as those in the lowest risk group. For both groups, the program increased perceptions about the negative consequences of using marijuana, the likelihood of becoming

Table 3. Program Effect Sizes by Risk Group for Cognitive Risk Factors at 18 Months From Baseline

Cognitive Risk Factor	Risk Levels Based on Preprogram Use: Nonusers (Level 1, n = 1,657) Effect Size	Significance	Experimenters (Level 2, n = 1,935) Effect Size	Significance	Users (Level 3, n = 684) Effect Size	Significance
Alcohol						
Drug use consequences						
Nonhealth beliefs	.12	***	.15	***	.14	***
Risk of dependence	.07	***	.08	**	.17	***
Harm of occasional use	.02		.07	**	.02	
Normative beliefs						
Perceived prevalence eighth grade	.09	**	.08	*	.16	**
Friends' approval of use	.02		.04		.02	
Respect for not using	.18	***	.16	***	.11	*
Resistance self-efficacy	.02		.02		.03	
Expectations of future use	.01		.05		.04	
	Nonusers (Level 1, n = 2,784) Effect Size	Significance	Experimenters (Level 2, n = 913) Effect Size	Significance	Users (Level 3, n =579) Effect Size	Significance
Cigarettes						
Drug use consequences						
Nonhealth beliefs	.13	***	.20	***	.17	***
Risk of dependence	.10	***	.17	***	.19	***
Harm of occasional use	.05	*	.07	**	.11	**
Normative beliefs						
Perceived prevalence eighth grade	.12	**	.12	*	.27	***
Friends' approval of use	.06	*	.10	**	.11	
Respect for not using	.17	***	.12	***	.05	

Resistance/self-efficacy	.05	**	.08	**	.02	
Expectations of future use	.07	**	.11	***	.10	**

	Low Risk (Level 1, n = 2,777)		Moderate Risk (Level 2, n = 1,216)		High Risk (Level 3, n = 283)	
	Effect Size	Significance	Effect Size	Significance	Effect Size	Significance
Marijuana						
Drug use consequences						
Nonhealth beliefs	.10	***	.20	***	.11	
Risk of dependence	.10	***	.22	***	.08	
Harm of occasional use	.03		.09	**	.00	
Normative beliefs						
Perceived prevalence eighth grade	.07	*	.14	*	.31	***
Friends' approval of use	.07	**	.13	**	.10	*
Respect for not using	.14	***	.14	***	.10	
Resistance/self-efficacy	.06	***	.11	*	.10	
Expectations of future use	.04	*	.15	***	.13	

NOTE: Table 3 shows the occurrence of significant reductions in pro-drug risk factors for the treatment students compared with the control students by risk group; the two columns provide effect sizes and significance of the associated two-tailed t test. A blank space indicates a p value greater than .10. No significant negative effects were observed. Risk groups for alcohol and cigarettes are defined by preprogram alcohol and preprogram cigarette use, respectively, whereas risk groups for marijuana are based on preprogram cigarette and marijuana use (see Analysis Procedures for definition of risk groups).

*$p < .10$ (not significant). ** Statistically significant at the .05 level. *** Statistically significant at the .01 level.

dependent on it, and the degree to which friends would disapprove of marijuana use and respect them for not using marijuana. In addition, for the low-risk group, ALERT increased perceptions of one's ability to resist using marijuana, whereas for the moderate-risk group, it raised perceptions of the likelihood of experiencing harm from occasional marijuana use and lowered intentions to use marijuana. However, Project ALERT had only one significant effect in the highest risk group (those who had already tried marijuana). These adolescents had substantially lower estimates of the prevalence of marijuana use among their peers than the control students.

For alcohol, ALERT's most substantial effects showed up for beliefs about alcohol use consequences and norms. The program significantly enhanced perceptions about the negative social and addictive consequences of drinking for all three risk groups, lowered prevalence estimates for users and nonusers, strengthened students' (nonusers and experimenters) beliefs that friends would respect them for refusing to drink, and helped the experimenters see that they could suffer harmful effects from occasional drinking. Nevertheless, it failed to modify alcohol-related resistance self-efficacy, future expectations of drinking, or perceptions about friends' approval of alcohol use.

DISCUSSION

Project ALERT had considerable success in dampening risk factors for drug use across all of the four cognitive domains that it targeted—perceived consequences of drug use, normative beliefs, expectations of future use, and resistance self-efficacy—for alcohol, cigarettes, and marijuana. The revised curriculum also mitigated these risk factors across adolescents with low, moderate, and high probabilities of future drug use. The effects were typically stronger and more numerous for baseline nonusers and experimenters than for users, but ALERT helped the latter become more aware of the serious consequences associated with smoking and drinking and their own susceptibility to becoming dependent if they smoked or drank regularly. It also helped these high-risk users recognize that not everyone uses, reducing their estimates of how many of their peers smoke, drink, and use marijuana. Hence, these results provide further evidence that universalistic programs can help youths at all levels of risk for future substance use and abuse.

In keeping with results from prior research, we found the strongest program effects for the normative beliefs' variables—knowledge about prevalence of use, perceived peer approval of drug use, and friends' reactions to drug use.[8-10] We also found positive program effects for drug use consequences that paralleled the findings for immediate consequences in the LST study[8] and functional meanings of use in Project Northland.[10] Finally, we found positive program effects for resistance self-efficacy, as did Project Northland but not LST or the Midwestern Prevention Project. Combined with the results from these earlier studies, our findings provide further support for the theoretical underpinnings of prevention programs that incorporate insights from social influence theory, the HBM, and the self-efficacy theory of behavior change.

We used the same measures here as in the earlier ALERT study to enable comparisons across the two studies. The revised ALERT curriculum outperformed the earlier program, yielding a greater number of significant effects than the original teacher-led curriculum.[15,30] Fifteen months after baseline, the original program failed to yield significant effects for resistance self-efficacy, beliefs about friends' approval, friends' respect, and

harm of occasional use associated with cigarette and marijuana use. In contrast, the revised curriculum yielded significant and sustained effects for each of the above risk factors 18 months after baseline. Neither curriculum modified alcohol resistance self-efficacy, perceptions about harm of occasional drinking, friends' approval of drinking, or intentions to drink, whereas both curricula reduced estimates of peer drinking. The revised curriculum also affected beliefs about the consequences of drinking, the likelihood of addiction to drinking, and friends' respect for not drinking; however, because the original study did not ask students about these beliefs, we cannot determine whether the earlier program had a similar successful impact on those risk factors.

The revised curriculum also improved on the original program's impact on high-risk youths in some instances. Both curricula had significant effects among the cigarette users on beliefs about the consequences of smoking and estimates of cigarette use among peers; the revised curriculum also significantly modified beliefs about addiction to smoking, harm of occasional smoking, and expectations of future cigarette use. Among the high-risk marijuana group, the original and revised curriculum both significantly affected estimates of peer marijuana use. This was the only result that was significant at the $p < .05$ criterion for this group. Finally, the revised curriculum had significant effects on beliefs about consequences of drinking, likelihood of addiction to drinking, and estimates of peer drinking among adolescents at high risk for alcohol use. However, because the original curriculum did not report these effects, we cannot compare our results with the original evaluation's findings.

Although the improvement in results may be attributable to changes other than those made to the curriculum (e.g., a different cohort from a different part of the United States), we note that the findings reported here correspond with the revisions made to ALERT—a new lesson focused on helping smokers quit and understand the benefits of quitting and a new lesson aimed at strengthening reasons not to drink. The findings also correspond with the middle school program's improved impact on drug use.[25] Across the entire sample, adolescents exposed to ALERT were less likely to smoke cigarettes, to engage in alcohol misuse, or to use marijuana. Consistent with the strong effects for cognitive risk factors across the three risk groups for smoking, ALERT yielded reductions in use for baseline smokers and experimenters, as well as for the nonusers. It also prevented marijuana initiation in the two groups that experienced the strongest and most numerous changes in drug use cognitions, the nonusers who had smoked cigarettes and those who had not.

The program's impact on alcohol misuse (across the entire sample and among the high-risk early drinkers) occurred despite the fact that it modified only half of the targeted alcohol-specific risk factors for the overall sample (Table 2). The significant effects, combined with the lack of a program effect on less serious alcohol use, suggest that perceptions of the consequences of drinking and one's personal susceptibility to them may be more important risk factors for alcohol misuse than for alcohol initiation or occasional use. Future analyses should test this hypothesis by examining the mediating impact of these cognitive risk factors on alcohol use and misuse. The proximal outcomes, which are the focus of this article, are also potential mediators of the curriculum's effects on drug use. Although some hypothesized mediating variables (those targeted by the program) may be affected by the program curriculum, they may not necessarily influence subsequent drug use. A mediating analysis would help determine which of the ALERT risk factors mediate the program's demonstrated effect on subsequent drug use among adolescents, thus providing additional insight in identifying what aspects of the program worked, what did not work, and where the program curriculum may be improved.

This study provides information on proximal-outcome effects for the overall adolescent sample and for adolescents at different levels of risk, for each substance separately. Few large-scale prevention programs have evaluated effects for high-risk youths, and fewer still have been revised in response to the initial research results and then reevaluated a decade later. This replication extends the results of Project ALERT to rural areas and small towns in the Midwest, while including a new racial/ethnic group (Native Americans) in the assessment. It also addresses the methodological weaknesses of some earlier drug prevention studies mentioned in the literature.[31] It has a randomized design with treatment assigned to entire schools, with adequate numbers of schools and students in each experimental condition. High response rates and internal consistency of the responses ensure representative data from these schools, and analytic procedures account for issues such as correlated observations within schools and study nonresponse, using sophisticated clustering and multiple-imputation techniques.

The present study was limited by a few factors. First, the largely rural and small-town setting of this study limits the generalizability of our results when viewed on a stand-alone basis. However, in conjunction with the original study, these results suggest that ALERT effects generalize to rural as well as urban and suburban communities, and to schools with substantial Native American populations as well as those serving other minority youth. Second, internal consistency of the three drug-specific measures of beliefs about drug use consequences was limited, but acceptable, and a few measures (e.g., prevalence estimates, friends' approval of use) were single items. Future research would benefit from more comprehensive measures of these constructs. However, whereas alphas of .80 or higher are desirable for studies of student-level effects, reliability as low as $\alpha = .50$ can be sufficient in research to test for group-level effects.[32,33] We also had some loss of sample at follow-up, but nonresponse should not have biased the results for program effects because attrition was similar across experimental conditions.

IMPLICATIONS FOR PRACTICE

Under amendments to the Safe and Drug-Free Schools and Communities Act in 1998, schools receiving federal grants are required to use evidence-based prevention curricula. Thus far, however, only about one-third of the nation's public schools and one-eighth of its private schools appear to have considered research findings when selecting a prevention curriculum.[34] Our findings underscore the value of policy and practice encouraging use of theory-based curricula with sound empirical evidence of demonstrated success.

The results from this study also provide strong empirical support for universalistic prevention programs in middle and junior high schools, indicating that they can be effective with both high- and low-risk adolescents. Hence, the findings counter previous criticisms that such programs fail to help the very youths who need them most. Given the multiple pathways to drug use, programs that dampen several risk factors are likely to have a greater impact on use and on youths at different levels of risk than those that mitigate only one or two. By integrating elements of social learning theory, the HBM, and the self-efficacy theory of behavior change into the curriculum's goals and activities,[12] Project ALERT directly targets multiple factors previously shown to affect drug use—beliefs about drug use consequences, social norms, resistance self-efficacy, and expectations about use. Our findings suggest that Project ALERT has succeeded in modifying the risk factors targeted by the curriculum and thus in translating its theoretical underpinnings into actuality.

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